SEQUENCE LISTING

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<120> Lipolytic enzyme variants

<130> 10470.204-US

<160> 14

<170> PatentIn version 3.3

<210> 1
<211> 269
<212> PRT
<213> Thermomyces lanuginosus

<400> 1

Glu Val Ser Gln Asp Leu Phe Asn Gln Phe Asn Leu Phe Ala Gln Tyr
1 5 10 15

Ser Ala Ala Ala Tyr Cys Gly Lys Asn Asn Asp Ala Pro Ala Gly Thr
20 25 30

Asn Ile Thr Cys Thr Gly Asn Ala Cys Pro Glu Val Glu Lys Ala Asp
35 40 45

Ala Thr Phe Leu Tyr Ser Phe Glu Asp Ser Gly Val Gly Asp Val Thr
50 55 60

Gly Phe Leu Ala Leu Asp Asn Thr Asn Lys Leu Ile Val Leu Ser Phe
65 70 75 80

Arg Gly Ser Arg Ser Ile Glu Asn Trp Ile Gly Asn Leu Asn Phe Asp
85 90 95

Leu Lys Glu Ile Asn Asp Ile Cys Ser Gly Cys Arg Gly His Asp Gly
100 105 110

Phe Thr Ser Ser Trp Arg Ser Val Ala Asp Thr Leu Arg Gln Lys Val
115 120 125

Glu Asp Ala Val Arg Glu His Pro Asp Tyr Arg Val Val Phe Thr Gly

130 135 140

His Ser Leu Gly Gly Ala Leu Ala Thr Val Ala Gly Ala Asp Leu Arg
145 150 155 160

Gly Asn Gly Tyr Asp Ile Asp Val Phe Ser Tyr Gly Ala Pro Arg Val
165 170 175

Gly Asn Arg Ala Phe Ala Glu Phe Leu Thr Val Gln Thr Gly Gly Thr
180 185 190

Leu Tyr Arg Ile Thr His Thr Asn Asp Ile Val Pro Arg Leu Pro Pro
195 200 205

Arg Glu Phe Gly Tyr Ser His Ser Ser Pro Glu Tyr Trp Ile Lys Ser
210 215 220

Gly Thr Leu Val Pro Val Thr Arg Asn Asp Ile Val Lys Ile Glu Gly
225 230 235 240

Ile Asp Ala Thr Gly Gly Asn Asn Gln Pro Asn Ile Pro Asp Ile Pro
245 250 255

Ala His Leu Trp Tyr Phe Gly Leu Ile Gly Thr Cys Leu
260 265

<210> 2
<211> 286
<212> PRT
<213> Fusarium oxysporum

<400> 2

Ala Val Gly Val Thr Thr Thr Asp Phe Ser Asn Phe Lys Phe Tyr Ile
1 5 10 15

Gln His Gly Ala Ala Ala Tyr Cys Asn Ser Glu Ala Ala Ala Gly Ser
20 25 30

Lys Ile Thr Cys Ser Asn Asn Gly Cys Pro Thr Val Gln Gly Asn Gly
35 40 45

Ala Thr Ile Val Thr Ser Phe Val Gly Ser Lys Thr Gly Ile Gly Gly
50 55 60

```
Tyr Val Ala Thr Asp Ser Ala Arg Lys Glu Ile Val Val Ser Phe Arg
65                  70                  75                  80

Gly Ser Ile Asn Ile Arg Asn Trp Leu Thr Asn Leu Asp Phe Gly Gln
                85                  90                  95

Glu Asp Cys Ser Leu Val Ser Gly Cys Gly Val His Ser Gly Phe Gln
            100                 105                 110

Arg Ala Trp Asn Glu Ile Ser Ser Gln Ala Thr Ala Ala Val Ala Ser
        115                 120                 125

Ala Arg Lys Ala Asn Pro Ser Phe Asn Val Ile Ser Thr Gly His Ser
    130                 135                 140

Leu Gly Gly Ala Val Ala Val Leu Ala Ala Ala Asn Leu Arg Val Gly
145                 150                 155                 160

Gly Thr Pro Val Asp Ile Tyr Thr Tyr Gly Ser Pro Arg Val Gly Asn
                165                 170                 175

Ala Gln Leu Ser Ala Phe Val Ser Asn Gln Ala Gly Gly Glu Tyr Arg
            180                 185                 190

Val Thr His Ala Asp Asp Pro Val Pro Arg Leu Pro Pro Leu Ile Phe
        195                 200                 205

Gly Tyr Arg His Thr Thr Pro Glu Phe Trp Leu Ser Gly Gly Gly Gly
    210                 215                 220

Asp Lys Val Asp Tyr Thr Ile Ser Asp Val Lys Val Cys Glu Gly Ala
225                 230                 235                 240

Ala Asn Leu Gly Cys Asn Gly Gly Thr Leu Gly Leu Asp Ile Ala Ala
                245                 250                 255

His Leu His Tyr Phe Gln Ala Thr Asp Ala Cys Asn Ala Gly Gly Phe
            260                 265                 270

Ser Trp Arg Arg Tyr Arg Ser Ala Glu Ser Val Asp Lys Arg
        275                 280                 285
```

<210> 3
<211> 265
<212> PRT
<213> Absidia reflexa

<400> 3

```
Ser Ser Ser Ser Thr Gln Asp Tyr Arg Ile Ala Ser Glu Ala Glu Ile
1               5                  10                  15

Lys Ala His Thr Phe Tyr Thr Ala Leu Ser Ala Asn Ala Tyr Cys Arg
            20                  25                  30

Thr Val Ile Pro Gly Gly Arg Trp Ser Cys Pro His Cys Gly Val Ala
        35                  40                  45

Ser Asn Leu Gln Ile Thr Lys Thr Phe Ser Thr Leu Ile Thr Asp Thr
    50                  55                  60

Asn Val Leu Val Ala Val Gly Glu Lys Glu Lys Thr Ile Tyr Val Val
65                  70                  75                  80

Phe Arg Gly Thr Ser Ser Ile Arg Asn Ala Ile Ala Asp Ile Val Phe
                85                  90                  95

Val Pro Val Asn Tyr Pro Pro Val Asn Gly Ala Lys Val His Lys Gly
            100                 105                 110

Phe Leu Asp Ser Tyr Asn Glu Val Gln Asp Lys Leu Val Ala Glu Val
        115                 120                 125

Lys Ala Gln Leu Asp Arg His Pro Gly Tyr Lys Ile Val Val Thr Gly
    130                 135                 140

His Ser Leu Gly Gly Ala Thr Ala Val Leu Ser Ala Leu Asp Leu Tyr
145                 150                 155                 160

His His Gly His Ala Asn Ile Glu Ile Tyr Thr Gln Gly Gln Pro Arg
                165                 170                 175

Ile Gly Thr Pro Ala Phe Ala Asn Tyr Val Ile Gly Thr Lys Ile Pro
            180                 185                 190

Tyr Gln Arg Leu Val His Glu Arg Asp Ile Val Pro His Leu Pro Pro
        195                 200                 205
```

```
Gly Ala Phe Gly Phe Leu His Ala Gly Glu Glu Phe Trp Ile Met Lys
    210                 215                 220

Asp Ser Ser Leu Arg Val Cys Pro Asn Gly Ile Glu Thr Asp Asn Cys
225                 230                 235                 240

Ser Asn Ser Ile Val Pro Phe Thr Ser Val Ile Asp His Leu Ser Tyr
                245                 250                 255

Leu Asp Met Asn Thr Gly Leu Cys Leu
            260                 265
```

<210> 4
<211> 264
<212> PRT
<213> Absidia corymbifera

<400> 4

```
Ser Ser Ser Thr Gln Asp Tyr Arg Ile Ala Ser Glu Ala Glu Ile Lys
1               5                   10                  15

Ala His Thr Phe Tyr Thr Ala Leu Ser Ala Asn Ala Tyr Cys Arg Thr
            20                  25                  30

Val Ile Pro Gly Gly Gln Trp Ser Cys Pro His Cys Asp Val Ala Pro
        35                  40                  45

Asn Leu Asn Ile Thr Lys Thr Phe Thr Thr Leu Ile Thr Asp Thr Asn
    50                  55                  60

Val Leu Val Ala Val Gly Glu Asn Glu Lys Thr Ile Tyr Val Val Phe
65                  70                  75                  80

Arg Gly Thr Ser Ser Ile Arg Asn Ala Ile Ala Asp Ile Val Phe Val
                85                  90                  95

Pro Val Asn Tyr Pro Pro Val Asn Gly Ala Lys Val His Lys Gly Phe
            100                 105                 110

Leu Asp Ser Tyr Asn Glu Val Gln Asp Lys Leu Val Ala Glu Val Lys
        115                 120                 125
```

```
Ala Gln Leu Asp Arg His Pro Gly Tyr Lys Ile Val Val Thr Gly His
    130                 135                 140

Ser Leu Gly Gly Ala Thr Ala Val Leu Ser Ala Leu Asp Leu Tyr His
145                 150                 155                 160

His Gly His Asp Asn Ile Glu Ile Tyr Thr Gln Gly Gln Pro Arg Ile
                165                 170                 175

Gly Thr Pro Glu Phe Ala Asn Tyr Val Ile Gly Thr Lys Ile Pro Tyr
            180                 185                 190

Gln Arg Leu Val Asn Glu Arg Asp Ile Val Pro His Leu Pro Pro Gly
        195                 200                 205

Ala Phe Gly Phe Leu His Ala Gly Glu Glu Phe Trp Ile Met Lys Asp
    210                 215                 220

Ser Ser Leu Arg Val Cys Pro Asn Gly Ile Glu Thr Asp Asn Cys Ser
225                 230                 235                 240

Asn Ser Ile Val Pro Phe Thr Ser Val Ile Asp His Leu Ser Tyr Leu
                245                 250                 255

Asp Met Asn Thr Gly Leu Cys Leu
            260
```

<210> 5
<211> 269
<212> PRT
<213> Rhizomucor miehei

<400> 5

```
Ser Ile Asp Gly Gly Ile Arg Ala Ala Thr Ser Gln Glu Ile Asn Glu
1               5                   10                  15

Leu Thr Tyr Tyr Thr Thr Leu Ser Ala Asn Ser Tyr Cys Arg Thr Val
            20                  25                  30

Ile Pro Gly Ala Thr Trp Asp Cys Ile His Cys Asp Ala Thr Glu Asp
        35                  40                  45

Leu Lys Ile Ile Lys Thr Trp Ser Thr Leu Ile Tyr Asp Thr Asn Ala
    50                  55                  60
```

```
Met Val Ala Arg Gly Asp Ser Glu Lys Thr Ile Tyr Ile Val Phe Arg
65                  70                  75                  80

Gly Ser Ser Ser Ile Arg Asn Trp Ile Ala Asp Leu Thr Phe Val Pro
                85                  90                  95

Val Ser Tyr Pro Pro Val Ser Gly Thr Lys Val His Lys Gly Phe Leu
            100                 105                 110

Asp Ser Tyr Gly Glu Val Gln Asn Glu Leu Val Ala Thr Val Leu Asp
        115                 120                 125

Gln Phe Lys Gln Tyr Pro Ser Tyr Lys Val Ala Val Thr Gly His Ser
    130                 135                 140

Leu Gly Gly Ala Thr Ala Leu Leu Cys Ala Leu Asp Leu Tyr Gln Arg
145                 150                 155                 160

Glu Glu Gly Leu Ser Ser Ser Asn Leu Phe Leu Tyr Thr Gln Gly Gln
                165                 170                 175

Pro Arg Val Gly Asp Pro Ala Phe Ala Asn Tyr Val Val Ser Thr Gly
            180                 185                 190

Ile Pro Tyr Arg Arg Thr Val Asn Glu Arg Asp Ile Val Pro His Leu
        195                 200                 205

Pro Pro Ala Ala Phe Gly Phe Leu His Ala Gly Glu Glu Tyr Trp Ile
    210                 215                 220

Thr Asp Asn Ser Pro Glu Thr Val Gln Val Cys Thr Ser Asp Leu Glu
225                 230                 235                 240

Thr Ser Asp Cys Ser Asn Ser Ile Val Pro Phe Thr Ser Val Leu Asp
                245                 250                 255

His Leu Ser Tyr Phe Gly Ile Asn Thr Gly Leu Cys Thr
            260                 265
```

<210> 6
<211> 271
<212> PRT

<213> Rhizopus oryzae

<400> 6

```
Ser Ala Ser Asp Gly Gly Lys Val Val Ala Ala Thr Thr Ala Gln Ile
1               5                  10                  15

Gln Glu Phe Thr Lys Tyr Ala Gly Ile Ala Ala Thr Ala Tyr Cys Arg
            20                  25                  30

Ser Val Val Pro Gly Asn Lys Trp Asp Cys Val Gln Cys Gln Lys Trp
        35                  40                  45

Val Pro Asp Gly Lys Ile Ile Thr Thr Phe Thr Ser Leu Leu Ser Asp
    50                  55                  60

Thr Asn Gly Tyr Val Leu Arg Ser Asp Lys Gln Lys Thr Ile Tyr Leu
65                  70                  75                  80

Val Phe Arg Gly Thr Asn Ser Phe Arg Ser Ala Ile Thr Asp Ile Val
                85                  90                  95

Phe Asn Phe Ser Asp Tyr Lys Pro Val Lys Gly Ala Lys Val His Ala
            100                 105                 110

Gly Phe Leu Ser Ser Tyr Glu Gln Val Val Asn Asp Tyr Phe Pro Val
        115                 120                 125

Val Gln Glu Gln Leu Thr Ala His Pro Thr Tyr Lys Val Ile Val Thr
    130                 135                 140

Gly His Ser Leu Gly Gly Ala Gln Ala Leu Leu Ala Gly Met Asp Leu
145                 150                 155                 160

Tyr Gln Arg Glu Pro Arg Leu Ser Pro Lys Asn Leu Ser Ile Phe Thr
                165                 170                 175

Val Gly Gly Pro Arg Val Gly Asn Pro Thr Phe Ala Tyr Tyr Val Glu
            180                 185                 190

Ser Thr Gly Ile Pro Phe Gln Arg Thr Val His Lys Arg Asp Ile Val
        195                 200                 205

Pro His Val Pro Pro Gln Ser Phe Gly Phe Leu His Pro Gly Val Glu
```

```
    210                 215                 220

Ser Trp Ile Lys Ser Gly Thr Ser Asn Val Gln Ile Cys Thr Ser Glu
225                 230                 235                 240

Ile Glu Thr Lys Asp Cys Ser Asn Ser Ile Val Pro Phe Thr Ser Ile
                245                 250                 255

Leu Asp His Leu Ser Tyr Phe Asp Ile Asn Glu Gly Ser Cys Leu
            260                 265                 270
```

<210> 7
<211> 267
<212> PRT
<213> Aspergillus niger

<400> 7

```
Thr Ala Gly Gln Ala Leu Ala Ala Ser Thr Gln Gly Ile Ser Glu Asp
1               5                   10                  15

Leu Tyr Asn Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala Ala Tyr
            20                  25                  30

Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu Lys Ile
        35                  40                  45

Tyr Asn Ala Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp Asp Thr
    50                  55                  60

Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp Thr Asn
65                  70                  75                  80

Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr Leu Pro
                85                  90                  95

Gln Cys Asn Asp Cys Glu Val His Gly Gly Tyr Tyr Ile Gly Trp Ile
            100                 105                 110

Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Ala Ser Gln
        115                 120                 125

Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Ser Leu Gly Ala Ser
    130                 135                 140
```

```
Met Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp Asn Val
145                 150                 155                 160

Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala Phe Ala
                165                 170                 175

Ser Tyr Met Asn Asp Ala Phe Gln Val Ser Ser Pro Glu Thr Thr Gln
            180                 185                 190

Tyr Phe Arg Val Thr His Ser Asn Asp Gly Ile Pro Asn Leu Pro Pro
        195                 200                 205

Ala Asp Glu Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser Val Asp
    210                 215                 220

Pro Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu Val Gln
225                 230                 235                 240

Cys Cys Glu Ala Gln Gly Gly Gln Gly Val Asn Asp Ala His Thr Thr
                245                 250                 255

Tyr Phe Gly Met Thr Ser Gly Ala Cys Thr Trp
            260                 265
```

<210> 8
<211> 266
<212> PRT
<213> Aspergillus tubingensis

<400> 8

```
Thr Ala Gly His Ala Leu Ala Ala Ser Thr Gln Gly Ile Ser Glu Asp
1               5                   10                  15

Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala Ala Tyr
            20                  25                  30

Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu Lys Ile
        35                  40                  45

Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp Asp Ser
    50                  55                  60

Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp Thr Asn
```

```
65                  70                  75                  80

Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr Leu Pro
                85                  90                  95

Gln Cys Asn Ser Cys Glu Val His Gly Gly Tyr Tyr Ile Gly Trp Ile
            100                 105                 110

Ser Val Gln Asp Gln Val Glu Ser Leu Val Gln Gln Gln Val Ser Gln
        115                 120                 125

Phe Pro Asp Tyr Ala Leu Thr Val Thr Gly His Ser Leu Gly Ala Ser
    130                 135                 140

Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp Asn Ile
145                 150                 155                 160

Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Asn Gln Ala Phe Ala Ser
                165                 170                 175

Tyr Met Asn Asp Ala Phe Gln Ala Ser Ser Pro Asp Thr Thr Gln Tyr
            180                 185                 190

Phe Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu Pro Pro Ala
        195                 200                 205

Asp Glu Gly Tyr Ala His Gly Val Val Glu Tyr Trp Ser Val Asp Pro
    210                 215                 220

Tyr Ser Ala Gln Asn Thr Phe Val Cys Thr Gly Asp Glu Val Gln Cys
225                 230                 235                 240

Cys Glu Ala Gln Gly Gly Gln Gly Val Asn Asn Ala His Thr Thr Tyr
                245                 250                 255

Phe Gly Met Thr Ser Gly His Cys Thr Trp
            260                 265
```

<210> 9
<211> 273
<212> PRT
<213> Fusarium heterosporum

<400> 9

```
Thr Val Thr Thr Gln Asp Leu Ser Asn Phe Arg Phe Tyr Leu Gln His
1               5                  10                  15

Ala Asp Ala Ala Tyr Cys Asn Phe Asn Thr Ala Val Gly Lys Pro Val
            20                  25                  30

His Cys Ser Ala Gly Asn Cys Pro Asp Ile Glu Lys Asp Ala Ala Ile
        35                  40                  45

Val Val Gly Ser Val Val Gly Thr Lys Thr Gly Ile Gly Ala Tyr Val
    50                  55                  60

Ala Thr Asp Asn Ala Arg Lys Glu Ile Val Val Ser Val Arg Gly Ser
65                  70                  75                  80

Ile Asn Val Arg Asn Trp Ile Thr Asn Phe Asn Phe Gly Gln Lys Thr
                85                  90                  95

Cys Asp Leu Val Ala Gly Cys Gly Val His Thr Gly Phe Leu Asp Ala
            100                 105                 110

Trp Glu Glu Val Ala Ala Asn Val Lys Ala Ala Val Ser Ala Ala Lys
        115                 120                 125

Thr Ala Asn Pro Thr Phe Lys Phe Val Val Thr Gly His Ser Leu Gly
    130                 135                 140

Gly Ala Val Ala Thr Ile Ala Ala Ala Tyr Leu Arg Lys Asp Gly Phe
145                 150                 155                 160

Pro Phe Asp Leu Tyr Thr Tyr Gly Ser Pro Arg Val Gly Asn Asp Phe
                165                 170                 175

Phe Ala Asn Phe Val Thr Gln Gln Thr Gly Ala Glu Tyr Arg Val Thr
            180                 185                 190

His Gly Asp Asp Pro Val Pro Arg Leu Pro Pro Ile Val Phe Gly Tyr
        195                 200                 205

Arg His Thr Ser Pro Glu Tyr Trp Leu Asn Gly Gly Pro Leu Asp Lys
    210                 215                 220
```

```
Asp Tyr Thr Val Thr Glu Ile Lys Val Cys Glu Gly Ile Ala Asn Val
225                 230                 235                 240

Met Cys Asn Gly Gly Thr Ile Gly Leu Asp Ile Leu Ala His Ile Thr
                245                 250                 255

Tyr Phe Gln Ser Met Ala Thr Cys Ala Pro Ile Ala Ile Pro Trp Lys
            260                 265                 270

Arg
```

<210> 10
<211> 278
<212> PRT
<213> Aspergillus oryzae

<400> 10

```
Asp Ile Pro Thr Thr Gln Leu Glu Asp Phe Lys Phe Trp Val Gln Tyr
1               5                   10                  15

Ala Ala Ala Thr Tyr Cys Pro Asn Asn Tyr Val Ala Lys Asp Gly Glu
            20                  25                  30

Lys Leu Asn Cys Ser Val Gly Asn Cys Pro Asp Val Glu Ala Ala Gly
        35                  40                  45

Ser Thr Val Lys Leu Ser Phe Ser Asp Asp Thr Ile Thr Asp Thr Ala
    50                  55                  60

Gly Phe Val Ala Val Asp Asn Thr Asn Lys Ala Ile Val Val Ala Phe
65                  70                  75                  80

Arg Gly Ser Tyr Ser Ile Arg Asn Trp Val Thr Asp Ala Thr Phe Pro
                85                  90                  95

Gln Thr Asp Pro Gly Leu Cys Asp Gly Cys Lys Ala Glu Leu Gly Phe
            100                 105                 110

Trp Thr Ala Trp Lys Val Val Arg Asp Arg Ile Ile Lys Thr Leu Asp
        115                 120                 125

Glu Leu Lys Pro Glu His Ser Asp Tyr Lys Ile Val Val Val Gly His
    130                 135                 140
```

```
Ser Leu Gly Ala Ala Ile Ala Ser Leu Ala Ala Ala Asp Leu Arg Thr
145                 150                 155                 160

Lys Asn Tyr Asp Ala Ile Leu Tyr Ala Tyr Ala Ala Pro Arg Val Ala
                165                 170                 175

Asn Lys Pro Leu Ala Glu Phe Ile Thr Asn Gln Gly Asn Asn Tyr Arg
            180                 185                 190

Phe Thr His Asn Asp Asp Pro Val Pro Lys Leu Pro Leu Leu Thr Met
        195                 200                 205

Gly Tyr Val His Ile Ser Pro Glu Tyr Tyr Ile Thr Ala Pro Asp Asn
    210                 215                 220

Thr Thr Val Thr Asp Asn Gln Val Thr Val Leu Asp Gly Tyr Val Asn
225                 230                 235                 240

Phe Lys Gly Asn Thr Gly Thr Ser Gly Gly Leu Pro Asp Leu Leu Ala
                245                 250                 255

Phe His Ser His Val Trp Tyr Phe Ile His Ala Asp Ala Cys Lys Gly
            260                 265                 270

Pro Gly Leu Pro Leu Arg
        275
```

<210> 11
<211> 278
<212> PRT
<213> Penicillium camemberti

<400> 11

```
Asp Val Ser Thr Ser Glu Leu Asp Gln Phe Glu Phe Trp Val Gln Tyr
1               5                   10                  15

Ala Ala Ala Ser Tyr Tyr Glu Ala Asp Tyr Thr Ala Gln Val Gly Asp
            20                  25                  30

Lys Leu Ser Cys Ser Lys Gly Asn Cys Pro Glu Val Glu Ala Thr Gly
        35                  40                  45
```

```
Ala Thr Val Ser Tyr Asp Phe Ser Asp Ser Thr Ile Thr Asp Thr Ala
    50                  55                  60

Gly Tyr Ile Ala Val Asp His Thr Asn Ser Ala Val Val Leu Ala Phe
65                  70                  75                  80

Arg Gly Ser Tyr Ser Val Arg Asn Trp Val Ala Asp Ala Thr Phe Val
                85                  90                  95

His Thr Asn Pro Gly Leu Cys Asp Gly Cys Leu Ala Glu Leu Gly Phe
            100                 105                 110

Trp Ser Ser Trp Lys Leu Val Arg Asp Asp Ile Ile Lys Glu Leu Lys
        115                 120                 125

Glu Val Val Ala Gln Asn Pro Asn Tyr Glu Leu Val Val Val Gly His
    130                 135                 140

Ser Leu Gly Ala Ala Val Ala Thr Leu Ala Ala Thr Asp Leu Arg Gly
145                 150                 155                 160

Lys Gly Tyr Pro Ser Ala Lys Leu Tyr Ala Tyr Ala Ser Pro Arg Val
                165                 170                 175

Gly Asn Ala Ala Leu Ala Lys Tyr Ile Thr Ala Gln Gly Asn Asn Phe
            180                 185                 190

Arg Phe Thr His Thr Asn Asp Pro Val Pro Lys Leu Pro Leu Leu Ser
        195                 200                 205

Met Gly Tyr Val His Val Ser Pro Glu Tyr Trp Ile Thr Ser Pro Asn
    210                 215                 220

Asn Ala Thr Val Ser Thr Ser Asp Ile Lys Val Ile Asp Gly Asp Val
225                 230                 235                 240

Ser Phe Asp Gly Asn Thr Gly Thr Gly Leu Pro Leu Leu Thr Asp Phe
                245                 250                 255

Glu Ala His Ile Trp Tyr Phe Val Gln Val Asp Ala Gly Lys Gly Pro
            260                 265                 270

Gly Leu Pro Phe Lys Arg
```

275

<210> 12
<211> 270
<212> PRT
<213> Aspergillus foetidus

<400> 12

Ser Val Ser Thr Ser Thr Leu Asp Glu Leu Gln Leu Phe Ala Gln Trp
1 5 10 15

Ser Ala Ala Ala Tyr Cys Ser Asn Asn Ile Asp Ser Lys Asp Ser Asn
20 25 30

Leu Thr Cys Thr Ala Asn Ala Cys Pro Ser Val Glu Glu Ala Ser Thr
35 40 45

Thr Met Leu Leu Glu Phe Asp Leu Thr Asn Asp Phe Gly Gly Thr Ala
50 55 60

Gly Phe Leu Ala Ala Asp Asn Thr Asn Lys Arg Leu Val Val Ala Phe
65 70 75 80

Arg Gly Ser Ser Thr Ile Glu Asn Trp Ile Ala Asn Leu Asp Phe Ile
85 90 95

Leu Glu Asp Asn Asp Asp Leu Cys Thr Gly Cys Lys Val His Thr Gly
100 105 110

Phe Trp Lys Ala Trp Glu Ser Ala Ala Asp Glu Leu Thr Ser Lys Ile
115 120 125

Lys Ser Ala Met Ser Thr Tyr Ser Gly Tyr Thr Leu Tyr Phe Thr Gly
130 135 140

His Ser Leu Gly Gly Ala Leu Ala Thr Leu Gly Ala Thr Val Leu Arg
145 150 155 160

Asn Asp Gly Tyr Ser Val Glu Leu Tyr Thr Tyr Gly Cys Pro Arg Ile
165 170 175

Gly Asn Tyr Ala Leu Ala Glu His Ile Thr Ser Gln Gly Ser Gly Ala
180 185 190

```
Asn Phe Arg Val Thr His Leu Asn Asp Ile Val Pro Arg Val Pro Pro
        195                 200                 205

Met Asp Phe Gly Phe Ser Gln Pro Ser Pro Glu Tyr Trp Ile Thr Ser
    210                 215                 220

Gly Asn Gly Ala Ser Val Thr Ala Ser Asp Ile Glu Val Ile Glu Gly
225                 230                 235                 240

Ile Asn Ser Thr Ala Gly Asn Ala Gly Glu Ala Thr Val Ser Val Leu
                245                 250                 255

Ala His Leu Trp Tyr Phe Phe Ala Ile Ser Glu Cys Leu Leu
            260                 265                 270
```

<210> 13
<211> 270
<212> PRT
<213> Aspergillus niger

<400> 13

```
Ser Val Ser Thr Ser Thr Leu Asp Glu Leu Gln Leu Phe Ser Gln Trp
1               5                   10                  15

Ser Ala Ala Ala Tyr Cys Ser Asn Asn Ile Asp Ser Asp Asp Ser Asn
            20                  25                  30

Val Thr Cys Thr Ala Asp Ala Cys Pro Ser Val Glu Glu Ala Ser Thr
        35                  40                  45

Lys Met Leu Leu Glu Phe Asp Leu Thr Asn Asn Phe Gly Gly Thr Ala
    50                  55                  60

Gly Phe Leu Ala Ala Asp Asn Thr Asn Lys Arg Leu Val Val Ala Phe
65                  70                  75                  80

Arg Gly Ser Ser Thr Ile Lys Asn Trp Ile Ala Asp Leu Asp Phe Ile
                85                  90                  95

Leu Gln Asp Asn Asp Asp Leu Cys Thr Gly Cys Lys Val His Thr Gly
            100                 105                 110

Phe Trp Lys Ala Trp Glu Ala Ala Ala Asp Asn Leu Thr Ser Lys Ile
```

```
        115                 120                 125

Lys Ser Ala Met Ser Thr Tyr Ser Gly Tyr Thr Leu Tyr Phe Thr Gly
    130                 135                 140

His Ser Leu Gly Gly Ala Leu Ala Thr Leu Gly Ala Thr Val Leu Arg
145                 150                 155                 160

Asn Asp Gly Tyr Ser Val Glu Leu Tyr Thr Tyr Gly Cys Pro Arg Val
                165                 170                 175

Gly Asn Tyr Ala Leu Ala Glu His Ile Thr Ser Gln Gly Ser Gly Ala
            180                 185                 190

Asn Phe Pro Val Thr His Leu Asn Asp Ile Val Pro Arg Val Pro Pro
        195                 200                 205

Met Asp Phe Gly Phe Ser Gln Pro Ser Pro Glu Tyr Trp Ile Thr Ser
    210                 215                 220

Gly Thr Gly Ala Ser Val Thr Ala Ser Asp Ile Glu Leu Ile Glu Gly
225                 230                 235                 240

Ile Asn Ser Thr Ala Gly Asn Ala Gly Glu Ala Thr Val Asp Val Leu
                245                 250                 255

Ala His Leu Trp Tyr Phe Phe Ala Ile Ser Glu Cys Leu Leu
            260                 265                 270
```

<210> 14
<211> 269
<212> PRT
<213> Aspergillus oryzae

<400> 14

```
Asp Val Ser Ser Ser Leu Leu Asn Asn Leu Asp Leu Phe Ala Gln Tyr
1               5                   10                  15

Ser Ala Ala Ala Tyr Cys Asp Glu Asn Leu Asn Ser Thr Gly Thr Lys
            20                  25                  30

Leu Thr Cys Ser Val Gly Asn Cys Pro Leu Val Glu Ala Ala Ser Thr
        35                  40                  45
```

```
Gln Ser Leu Asp Glu Phe Asn Glu Ser Ser Ser Tyr Gly Asn Pro Ala
    50                  55                  60

Gly Tyr Leu Ala Ala Asp Glu Thr Asn Lys Leu Leu Val Leu Ser Phe
65                  70                  75                  80

Arg Gly Ser Ala Asp Leu Ala Asn Trp Val Ala Asn Leu Asn Phe Gly
                85                  90                  95

Leu Glu Asp Ala Ser Asp Leu Cys Ser Gly Cys Glu Val His Ser Gly
            100                 105                 110

Phe Trp Lys Ala Trp Ser Glu Ile Ala Asp Thr Ile Thr Ser Lys Val
        115                 120                 125

Glu Ser Ala Leu Ser Asp His Ser Asp Tyr Ser Leu Val Leu Thr Gly
    130                 135                 140

His Ser Tyr Gly Ala Ala Leu Ala Ala Leu Ala Ala Thr Ala Leu Arg
145                 150                 155                 160

Asn Ser Gly His Ser Val Glu Leu Tyr Asn Tyr Gly Gln Pro Arg Leu
                165                 170                 175

Gly Asn Glu Ala Leu Ala Thr Tyr Ile Thr Asp Gln Asn Lys Gly Gly
            180                 185                 190

Asn Tyr Arg Val Thr His Thr Asn Asp Ile Val Pro Lys Leu Pro Pro
        195                 200                 205

Thr Leu Leu Gly Tyr His His Phe Ser Pro Glu Tyr Tyr Ile Ser Ser
    210                 215                 220

Ala Asp Glu Ala Thr Val Thr Thr Thr Asp Val Thr Glu Val Thr Gly
225                 230                 235                 240

Ile Asp Ala Thr Gly Gly Asn Asp Gly Thr Asp Gly Thr Ser Ile Asp
                245                 250                 255

Ala His Arg Trp Tyr Phe Ile Tyr Ile Ser Glu Cys Ser
            260                 265
```

Figure 1.

Alignment of fungal lipolytic enzyme sequences

```
                  1                                                  50
SEQ ID NO: 1      .......... EVSQDLFNQF NLFAQYSAAA .......YCG KNNDAPAGTN     33
SEQ ID NO: 2      ........AV GVTTTDFSNF KFYIQHGAAA .......YC. .NSEAAAGSK     33
SEQ ID NO: 3      SSSSTQDYRI ASEAEIKAHT FYTALSANA. .......YCR TVIPG.....
SEQ ID NO: 4      .SSSTQDYRI ASEAEIKAHT FYTALSANA. .......YCR TVIPG.....
SEQ ID NO: 5      ..SIDGGIRA ATSQEINELT YYTTLSANS. .......YCR TVIPG.....
SEQ ID NO: 6      .SASDGGKVV AATTAQIQEF TKYAGIAATA .......YCR SVVPG.....
SEQ ID NO: 7      ....TAGQAL AASTQ.GISE DLYNRL.VEM ATISQAAYAD LCNIPST...
SEQ ID NO: 8      ....TAGHAL AASTQ.GISE DLYSRL.VEM ATISQAAYAD LCNIPST...
SEQ ID NO: 9      .......... TVTTQDLSNF RFYLQHADAA .......YC. .NFNTAVGKP
SEQ ID NO: 10     .......... DIPTTQLEDF KFWVQYAAAT .......YCP NNYVAKDGEK
SEQ ID NO: 11     .......... DVSTSELDQF EFWVQYAAAS .......YYE ADYTAQVGDK
SEQ ID NO: 12     .......... SVSTSTLDEL QLFAQWSAAA .......YCS NNID.SKDSN
SEQ ID NO: 13     .......... SVSTSTLDEL QLFSQWSAAA .......YCS NNID.SDDSN
SEQ ID NO: 14     .......... DVSSSLLNNL DLFAQYSAAA .......YCD ENLN.STGTK

                  51                                                 100
SEQ ID NO: 1      ITCTGNACPE VEKADATFLY SFE.DSGVGD VTGFLALDNT NKLIVLSFRG     82
SEQ ID NO: 2      ITCSNNGCPT VQGNGATIVT SF..VGSKTG IGGYVATDSA RKEIVVSFRG     81
SEQ ID NO: 3      GRWSCPHCGV AS..NLQITK TFST..LITD TNVLVAVGEK EKTIYVVFRG
SEQ ID NO: 4      GQWSCPHCDV AP..NLNITK TFTT..LITD TNVLVAVGEN EKTIYVVFRG
SEQ ID NO: 5      ATWDCIHCDA TE..DLKIIK TWST..LIYD TNAMVARGDS EKTIYIVFRG
SEQ ID NO: 6      NKWDCVQCQK WVP.DGKIIT TFTS..LLSD TNGYVLRSDK QKTIYLVFRG
SEQ ID NO: 7      .......... .......IIK GEKIYNAQTD INGWILRDDT SKEIITVFRG
SEQ ID NO: 8      .......... .......IIK GEKIYNSQTD INGWILRDDS SKEIITVFRG
SEQ ID NO: 9      VHCSAGNCPD IEKDAAIVVG SV..VGTKTG IGAYVATDNA RKEIVVSVRG
SEQ ID NO: 10     LNCSVGNCPD VEAAGSTVKL SFS.DDTITD TAGFVAVDNT NKAIVVAFRG
SEQ ID NO: 11     LSCSKGNCPE VEATGATVSY DFS.DSTITD TAGYIAVDHT NSAVVLAFRG
SEQ ID NO: 12     LTCTANACPS VEEASTTMLL EFDLTNDFGG TAGFLAADNT NKRLVVAFRG
SEQ ID NO: 13     VTCTADACPS VEEASTKMLL EFDLTNNFGG TAGFLAADNT NKRLVVAFRG
SEQ ID NO: 14     LTCSVGNCPL VEAASTQSLD EFNESSSYGN PAGYLAADET NKLLVLSFRG

                  101                                                150
SEQ ID NO: 1      SRSIENWIGN LNFDLKEIND I..CSGCRGH DGFTSSWRSV ADTLRQKVED    130
SEQ ID NO: 2      SINIRNWLTN LDFG.QEDCS L..VSGCGVH SGFQRAWNEI SSQATAAVAS    128
SEQ ID NO: 3      TSSIRNAIAD IVFVPVNYPP V...NGAKVH KGFLDSYNEV QDKLVAEVKA
SEQ ID NO: 4      TSSIRNAIAD IVFVPVNYPP V...NGAKVH KGFLDSYNEV QDKLVAEVKA
SEQ ID NO: 5      SSSIRNWIAD LTFVPVSYPP V...SGTKVH KGFLDSYGEV QNELVATVLD
SEQ ID NO: 6      TNSFRSAITD IVFNFSDYKP V...KGAKVH AGFLSSYEQV VNDYFPVVQE
SEQ ID NO: 7      TGSDTNLQLD TNYTLTPFDT LPQCNDCEVH GGYYIGWISV QDQVESLVKQ
SEQ ID NO: 8      TGSDTNLQLD TNYTLTPFDT LPQCNSCEVH GGYYIGWISV QDQVESLVQQ
SEQ ID NO: 9      SINVRNWITN FNFG.QKTCD L..VAGCGVH TGFLDAWEEV AANVKAAVSA
SEQ ID NO: 10     SYSIRNWVTD ATFP.QTDPG L..CDGCKAE LGFWTAWKVV RDRIIKTLDE
SEQ ID NO: 11     SYSVRNWVAD ATFV.HTNPG L..CDGCLAE LGFWSSWKLV RDDIIKELKE
SEQ ID NO: 12     SSTIENWIAN LDFILEDNDD L..CTGCKVH TGFWKAWESA ADELTSKIKS
SEQ ID NO: 13     SSTIKNWIAD LDFILQDNDD L..CTGCKVH TGFWKAWEAA ADNLTSKIKS
SEQ ID NO: 14     SADLANWVAN LNFGLEDASD L..CSGCEVH SGFWKAWSEI ADTITSKVES

                  151                                                200
SEQ ID NO: 1      AVREHPDYRV VFTGHSLGGA LATVAGADLR GNGY.....D IDVFSYGAPR    175
SEQ ID NO: 2      ARKANPSFNV ISTGHSLGGA VAVLAAANLR VGGT.....P VDIYTYGSPR    173
SEQ ID NO: 3      QLDRHPGYKI VVTGHSLGGA TAVLSALDLY HHGHA....N IEIYTQGQPR
SEQ ID NO: 4      QLDRHPGYKI VVTGHSLGGA TAVLSALDLY HHGHD....N IEIYTQGQPR
SEQ ID NO: 5      QFKQYPSYKV AVTGHSLGGA TALLCALDLY QREEGLSSSN LFLYTQGQPR
SEQ ID NO: 6      QLTAHPTYKV IVTGHSLGGA QALLAGMDLY QREPRLSPKN LSIFTVGGPR
SEQ ID NO: 7      QASQYPDYAL TVTGHSLGAS MAALTAAQL. SATYD....N VRLYTFGEPR
SEQ ID NO: 8      QVSQFPDYAL TVTGHSLGAS LAALTAAQL. SATYD....N IRLYTFGEPR
SEQ ID NO: 9      AKTANPTFKF VVTGHSLGGA VATIAAAYLR KDGF.....P FDLYTYGSPR
SEQ ID NO: 10     LKPEHSDYKI VVVGHSLGAA IASLAAADLR TKNY.....D AILYAYAAPR
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Fig. 1 cont.

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SEQ ID NO: 11  VVAQNPNYEL VVVGHSLGAA VATLAATDLR GKGYP....S AKLYAYASPR
SEQ ID NO: 12  AMSTYSGYTL YFTGHSLGGA LATLGATVLR NDGY.....S VELYTYGCPR
SEQ ID NO: 13  AMSTYSGYTL YFTGHSLGGA LATLGATVLR NDGY.....S VELYTYGCPR
SEQ ID NO: 14  ALSDHSDYSL VLTGHSYGAA LAALAATALR NSGH.....S VELYNYGQPR

                201                                                 250
SEQ ID NO: 1   VGNRAFAEFL TVQ......T GGTLYRITHT NDIVPRLPPR EFGYSHSSPE   219
SEQ ID NO: 2   VGNAQLSAFV SNQ....... AGGEYRVTHA DDPVPRLPPL IFGYRHTTPE   216
SEQ ID NO: 3   IGTPAFANYV IGT....... KIPYQRLVHE RDIVPHLPPG AFGFLHAGEE
SEQ ID NO: 4   IGTPEFANYV IGT....... KIPYQRLVNE RDIVPHLPPG AFGFLHAGEE
SEQ ID NO: 5   VGDPAFANYV VST....... GIPYRRTVNE RDIVPHLPPA AFGFLHAGEE
SEQ ID NO: 6   VGNPTFAYYV EST....... GIPFQRTVHK RDIVPHVPPQ SFGFLHPGVE
SEQ ID NO: 7   SGNQAFASYM NDAFQVSSPE TTQYFRVTHS NDGIPNLPPA DEGYAHGGVE
SEQ ID NO: 8   S.NQAFASYM NDAFQASSPD TTQYFRVTHA NDGIPNLPPA DEGYAHGVVE
SEQ ID NO: 9   VGNDFFANFV TQQ....... TGAEYRVTHG DDPVPRLPPI VFGYRHTSPE
SEQ ID NO: 10  VANKPLAEFI TNQ....... .GNNYRFTHN DDPVPKLPLL TMGYVHISPE
SEQ ID NO: 11  VGNAALAKYI TAQ....... .GNNFRFTHT NDPVPKLPLL SMGYVHVSPE
SEQ ID NO: 12  IGNYALAEHI TSQ......G SGANFRVTHL NDIVPRVPPM DFGFSQPSPE
SEQ ID NO: 13  VGNYALAEHI TSQ......G SGANFPVTHL NDIVPRVPPM DFGFSQPSPE
SEQ ID NO: 14  LGNEALATYI TDQ......N KGGNYRVTHT NDIVPKLPPT LLGYHHFSPE

                251                                                 300
SEQ ID NO: 1   YWIKS..GTL VPVTRNDIVK IEGIDATG.G NNQPNIP... DIPAHLWYF.   262
SEQ ID NO: 2   FWLSGGGGDK VDYTISDVKV CEGAANLG.C NGGTLGL... DIAAHLHYF.   261
SEQ ID NO: 3   FWIMK..... ....DSSLRV CPNGIETDNC SNSIVPFT.. SVIDHLSYLD
SEQ ID NO: 4   FWIMK..... ....DSSLRV CPNGIETDNC SNSIVPFT.. SVIDHLSYLD
SEQ ID NO: 5   YWITD..... ..NSPETVQV CTSDLETSDC SNSIVPFT.. SVLDHLSYFG
SEQ ID NO: 6   SWIKS..... ...GTSNVQI CTSEIETKDC SNSIVPFT.. SILDHLSYFD
SEQ ID NO: 7   YWSV....DP YSAQNTFVCT GDEVQCCE.A QGGQGVN... ..DAHTTYF.
SEQ ID NO: 8   YWSV....DP YSAQNTFVCT GDEVQCCE.A QGGQGVN... ..NAHTTYF.
SEQ ID NO: 9   YWLNG.GPLD KDYTVTEIKV CEGIANVM.C NGGTIGL... DILAHITYF.
SEQ ID NO: 10  YYITA..PDN TTVTDNQVTV LDGYVNFK.G NTGTSGGLPD LLAFHSHVWY
SEQ ID NO: 11  YWITS..PNN ATVSTSDIKV IDGDVSFD.G NTGTGLPLLT DFEAHIWYF.
SEQ ID NO: 12  YWITS..GNG ASVTASDIEV IEGINSTA.G NAGEATV... SVLAHLWYF.
SEQ ID NO: 13  YWITS..GTG ASVTASDIEL IEGINSTA.G NAGEATV... DVLAHLWYF.
SEQ ID NO: 14  YYISS..ADE ATVTTTDVTE VTGIDATG.G NDGTDGT... SIDAHRWYF.

                301                                                 350
SEQ ID NO: 1   GLIGT.CL.. .......... .......... .......... ..........   269
SEQ ID NO: 2   QATDA.CNAG GFS....... .......... .......... ..........   286
SEQ ID NO: 3   MNTGL.CL.. .......... .......... .......... ..........
SEQ ID NO: 4   MNTGL.CL.. .......... .......... .......... ..........
SEQ ID NO: 5   INTGL.CT.. .......... .......... .......... ..........
SEQ ID NO: 6   INEGS.CL.. .......... .......... .......... ..........
SEQ ID NO: 7   GMTSGACTW. .......... .......... .......... ..........
SEQ ID NO: 8   GMTSGHCTW
SEQ ID NO: 9   QSMAT.CAPI AIPWKR.... .......... .......... ..........
SEQ ID NO: 10  FIHADACKGP GLPLR..... .......... .......... ..........
SEQ ID NO: 11  VQVDAGKGPG LPFKR..... .......... .......... ..........
SEQ ID NO: 12  FAISE.CLL. .......... .......... .......... ..........
SEQ ID NO: 13  FAISE.CLL. .......... .......... .......... ..........
SEQ ID NO: 14  IYISE.CS.. .......... .......... .......... ..........
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